



**NTSB** National Transportation Safety Board

# Aviation Lesson Learned:

**Better  
Collaboration  
Can Help  
Improve Safety  
*and* Productivity**

Presentation to: DOE Nuclear  
Executive Leadership Training

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# The Contrast

- **Conventional Wisdom:**

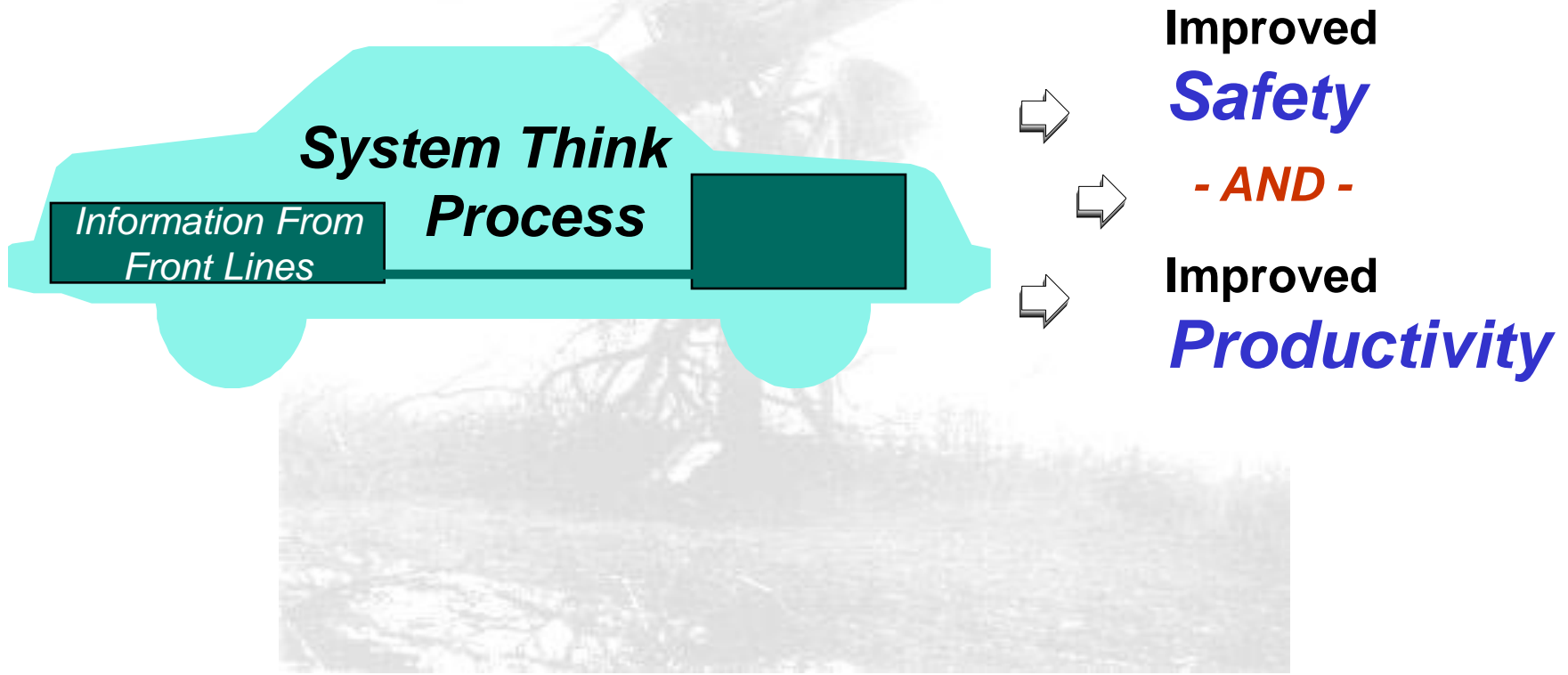
Improvements that reduce risk usually  
*also reduce productivity*

- **Lesson Learned from Proactive Aviation Safety Information Programs:**

Risk can be reduced in a way that also results in  
*immediate productivity improvements*



# Process Plus Fuel Creates A Win-Win



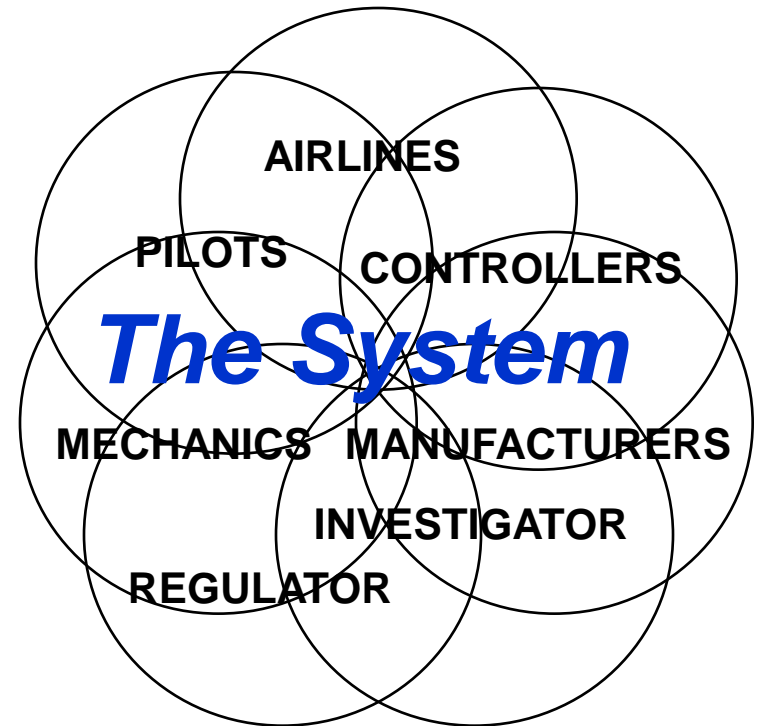
# Outline

- **The Context**
- **Importance of “System Think”**
- **Importance of Better Information**
- **Safety Benefits**
- **Productivity Benefits**
- **Aviation Successes and Failures**
- **Roles of Leadership and Regulator**



# The Context: Increasing Complexity

- **More System**  
*Interdependencies*
  - Large, complex, interactive system
  - Often tightly coupled
  - Hi-tech components
  - Continuous innovation
  - Ongoing evolution
- **Safety Issues Are More Likely to Involve**  
*Interactions Between Parts of the System*



# Effects of Increasing Complexity:

## **More** “Human Error” Because

- **System More Likely to be Error Prone**
- **Operators More Likely to Encounter Unanticipated Situations**
- **Operators More Likely to Encounter Situations in Which “By the Book” May Not Be Optimal (“workarounds”)**

# The Result:

## Front-Line Staff Who Are

- Highly Trained
- Competent
- Experienced,
- Trying to Do the Right Thing, and
- Proud of Doing It Well

**. . . Yet They Still Commit**

**Inadvertent  
Human Errors**

# When Things Go Wrong

## How It Is Now . . .

You are highly trained

*and*

If you did as trained, you  
would not make mistakes

so

You weren't careful  
enough

so

You should be **PUNISHED!**

## How It Should Be . . .

You are human

*and*

Humans make mistakes

so

Let's *also* explore why the  
system allowed, or failed to  
accommodate, your mistake

*and*

Let's **IMPROVE THE SYSTEM!**



# Fix the Person or the System?

Is the **Person**  
*Clumsy?*

Or Is the  
Problem . . .

The *Step???*



# **Enhance Understanding of Person/System Interactions By:**

- Collecting,**
  - Analyzing, and**
  - Sharing**
- # **Information**

# Objectives:

**Make the System**

***(a) Less  
Error Prone***

**and**

***(b) More  
Error Tolerant***

# **The Health Care Industry**

## ***To Err Is Human:***

### ***Building a Safer Health System***

**“The focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system.”**

**Institute of Medicine, Committee on Quality of Health Care in America, 1999**

# **Major Source of Information: Hands-On “Front-Line” Employees**

**“We Knew About  
That Problem”**

***(and we knew it might hurt  
someone sooner or later)***



# Next Challenge



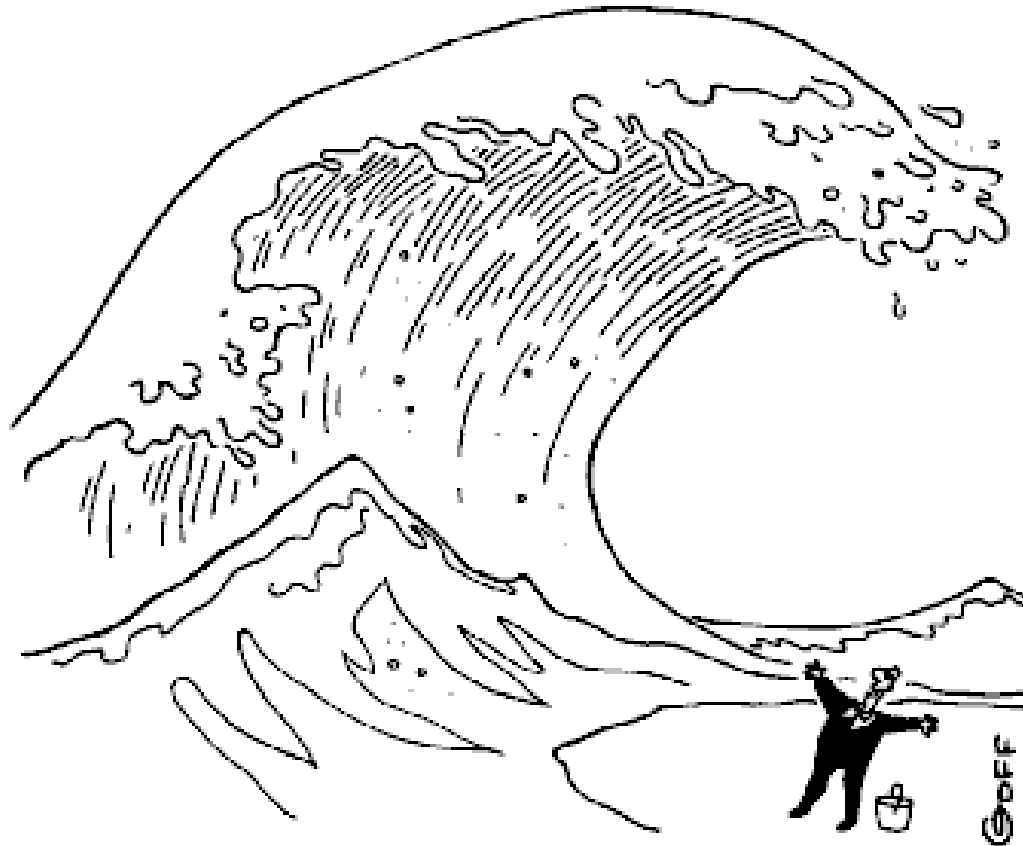
**Legal/Cultural Issues**

**Improved Analytical Tools**

*As we begin to get over the first hurdle, we must start working on the next one . . .*

# Information Overload

© 1996 Ted Goff



"EUREKA! MORE INFORMATION!"

# From Data to Information

*Tools and processes to convert large quantities of data into useful information*

## Data Sources

Info from front line staff and other sources

**DATA**



**Analysts**

**USEFUL**

**INFORMATION**

## Smart Decisions

- Identify issues
- **PRIORITIZE!!!**
- Develop solutions
- Evaluate interventions

**Tools**

**Processes**



# Aviation Success Story

**65% Decrease** in Fatal Accident Rate,  
1997 - 2007

largely because of  
***System Think***

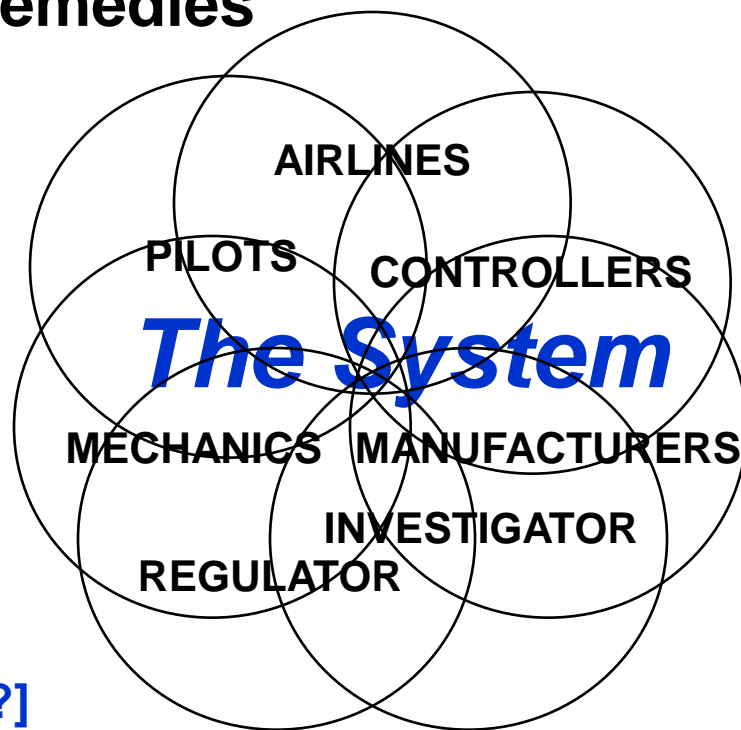
fueled by  
***Proactive Safety  
Information Programs***

P.S. Aviation was already considered **VERY SAFE** in 1997!!

# Aviation “System Think” Success

Engage All Participants In Identifying Problems and Developing and Evaluating Remedies

- Airlines
- Manufacturers
  - *With the systemwide effort*
  - *With their own end users*
- Air Traffic Organizations
- Labor
  - *Pilots*
  - *Mechanics*
  - *Air traffic controllers*
- Regulator(s) **[Query: Investigator(s)?]**





# **Major Paradigm Shift**

- Old: The regulator identifies a problem, develops solutions**
  - Industry skeptical of regulator's understanding of the problem
  - Industry fights regulator's solution and/or implements it begrudgingly
- New: Collaborative “System Think”**
  - Industry involved in indentifying problem
  - Industry “buy-in” re solution because everyone had input, everyone's interests considered
  - Prompt and willing implementation
  - Solution probably more effective and efficient
  - Unintended consequences much less likely

# Challenges of Collaboration

- Requires all to be willing, in their enlightened self-interest, to leave their “comfort zone” and think of the System
- Not a democracy
  - Regulator must regulate
- Regulator probably not welcome
- Labor/Management issues between some participants
- Participants are potential co-defendants

TRUST

# **Applicability of Collaborative Approach:**

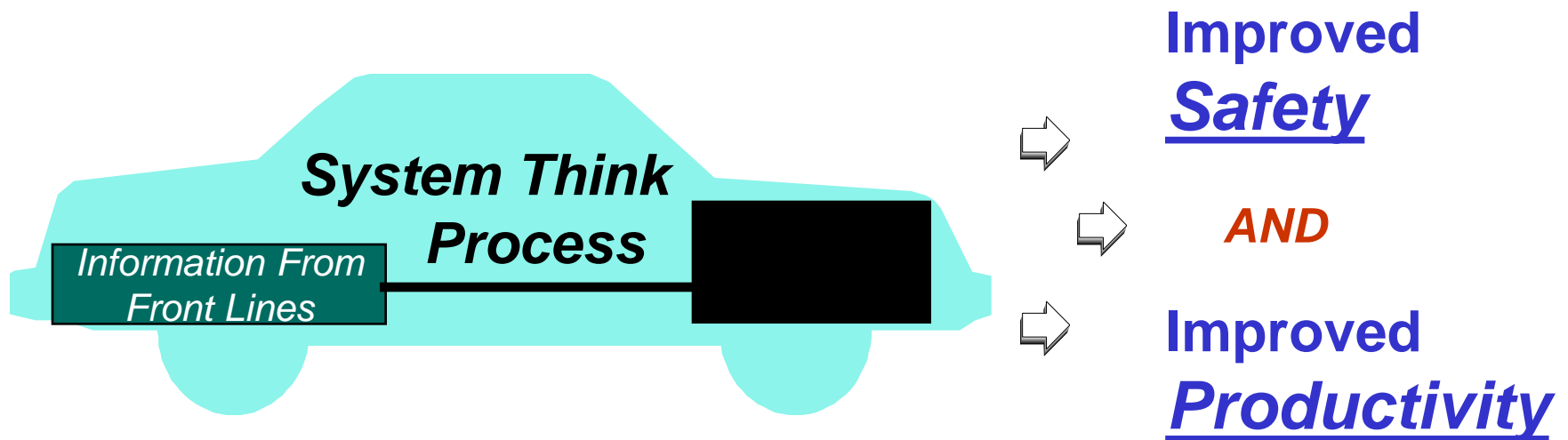
- **Entire Industry**
- **Company (Some or All)**
- **Type of Activity**
- **Facility**
- **Team**

# Manufacturer “System Think” Success

**Aircraft Manufacturers are Increasingly Seeking Input, Throughout the Design Process, From**

- *Pilots* (User Friendly)
- *Mechanics* (Maintenance Friendly)
- *Air Traffic Services* (System Friendly)

# **Process Plus Fuel Can Produce An Amazing Win-Win**





# **Not Only Improved Safety, But Improved Productivity, Too**

- **Ground Proximity Warning System**
  - ***S: Reduced warning system complacency***
  - ***P: Reduced unnecessary missed approaches, saved workload, time, and fuel***
- **Flap Overspeed**
  - ***S: No more potentially compromised airplanes***
  - ***P: Significantly reduced need to take airplanes off line for **VERY EXPENSIVE (!!) disassembly, inspection, repair, and reassembly*****

**But Then . . .**

**Why Are We**

**So Jaded in The Belief That**

***Improving Safety***

***Will Probably***

***Hurt The Bottom Line??***

# Costly Result\$ Of Safety Improvements Poorly Done

## Safety *Poorly* Done

### 1. Punish/re-train operator

- *Poor workforce morale*
- *Poor labor-management relations*
- *Labor reluctant to tell management what's wrong*
- *Retraining/learning curve of new employee if “perpetrator” moved/fired*
- *Adverse impacts of equipment design ignored, problem may recur because manufacturers are not involved in improvement process*
- *Adverse impacts of procedures ignored, problem may recur because procedure originators (management and/or regulator) are not involved in improvement process*

## Safety *Well* Done

Look beyond operator,  
also consider system  
issues

# Costly Result\$ Of Safety Poorly Done (con't)

## Safety **Poorly** Done

### 2. Management decides remedies unilaterally

- *Problem may not be fixed*
- *Remedy may not be most effective, may generate other problems*
- *Remedy may not be most cost effective, may reduce productivity*
- *Reluctance to develop/implement remedies due to past remedy failures*
- *Remedies less likely to address multiple problems*

### 3. Remedies based upon instinct, gut feeling

- *Same costly results as No. 2, above*

## Safety **Well** Done

### Apply “System Think,” *with workers*, to identify and solve problems

### Remedies based upon evidence (including info from front-line workers)

# Costly Result\$

## Of Safety Poorly Done (con't)

### Safety **Poorly** Done

4. Implementation is last step

- *No measure of how well remedy worked (until next mishap)*
- *No measure of unintended consequences (until something else goes wrong)*

### Safety **Well** Done

Evaluation after implementation

### Conclusion: Is Safety Good Business?

- *Safety implemented poorly can be **very costly (and ineffective)***
- *Safety implemented well, in addition to improving safety more effectively, can also **create benefits greater than the costs***



# The Role of Leadership

- Demonstrate Safety Commitment . . .

***But Acknowledge That Mistakes Will Happen***

- Include “Us” (e.g., System) Issues,

Not Just “You” (e.g., Training) Issues

- **Make Safety a Middle Management Metric**

- Engage Labor Early

- Include the **System** --

Manufacturers, Operators, Regulator(s), and Others

- Encourage and Facilitate Reporting

- Provide **Feedback**

- Provide Adequate **Resources**

- **Follow Through** With Action

# How The Regulator Can Help

- Emphasize the importance of System issues *in addition to* (not instead of) worker issues
  - Encourage and participate in industry-wide “System Think”
- Facilitate collection and analysis of information
  - Clarify and announce *policies for protecting information and those who provide it*
    - Encourage other industry participants to do the same
- Recognize that *compliance* is very important, but the *mission is reducing systemic risk*

Thank You!!!



*Questions?*